

BIOL 1107: Principles of Biology I (Fall Semester 2009)

Lecture (BC 1023): Monday, Wednesday, 3:30 p.m. – 4:45 p.m.
Laboratory (BC 2071): Section J: Monday, 10:00 a.m. - 12:50 p.m.;
Section K: Tuesday, 9:00-11:50 a.m.;
Section L: Wednesday, 9:00-11:50 a.m.;

Instructor: Dr. Gretchen Bielmyer
Office: BC 1097
Office hours: Tues. 2:00 p.m. – 3:00 p.m.; Wed. 2:00 p.m. – 3:00 p.m.
Office Phone: (229) 333-5766
Email: gkbielmyer@valdosta.edu

NOTE: I have an open door policy. Please stop by my office anytime you have questions, concerns, ideas, need advice, etc. To request alternative appointments, please email me directly.

Welcome to Principles of Biology I. This is the first course in a series designed to help you develop a strong foundation in the biological sciences to build on throughout your studies at VSU and beyond.

BIOL 1107 Course Description. An introduction to the principles of biology for science majors, with an emphasis on the cellular nature of life. Concepts covered include the origin and early evolution of cellular life; cell structure, function, metabolism, and reproduction; cell signaling; and gene regulation in bacteria and eukaryotes.

Course Objectives: The goal of this course is to stimulate student learning of these basic concepts and to encourage contemplation of the significance of each concept to the general field of biology.

Educational Outcomes:

- Develop and test hypotheses, collect and analyze data, and present the results and conclusions
- Exhibit an understanding of basic biological chemistry
- Describe the evolutionary processes responsible for biological diversity, explain the phylogenetic relationships among the major taxa of life, and provide examples
- Demonstrate an understanding of the cellular basis of life

Required Materials:

- **Text:** Sadava, D., Heller, H.C., Orians, G.H., Purves, W.K., & Hillis, D.M. 2008. LIFE: The Science of Biology. Eighth Edition. Sinauer Associates, Inc., Sunderland, MA, and W.H. Freeman & Co., Gordonsville, VA.
- **Three Ring Binder**

Grade Assessment: Your final grade will be based on your performance on lecture examinations and the laboratory. Additional unannounced research and writing assignments may be assigned to count toward the final grade during the semester.

Lecture: (500pts)

Exams. There will be four lecture exams followed by a cumulative final. Students are required to learn the lecture material and the readings from the text for all exams. Related information presented in the laboratory may also be included in exams. Exam format will be specified by your instructor. The unit exams are not cumulative. Each of the unit exams and the cumulative final exam will be worth 100 points. The final exam will be taken during the allotted time published online and posted below. **There are NO MAKEUP EXAMS**, with the exception of those students with a University related excuse or an emergency. Otherwise, a missed exam will be equal to zero points.

Laboratory: (130 pts) Students will be graded on their performance in laboratory based on attendance, quiz grades, lab notebooks, group lab projects, selected homework assignments, and other assignments as specified by your instructor. **There are NO MAKEUP LABS.**

Lab Quizzes: Quizzes (worth 8 points each) are given weekly during the first 10 to 15-minutes of each laboratory. **DO NOT BE LATE.** You will not be allowed extra time if you are late. If you miss the quiz completely, you will receive a zero for the quiz. Some of the questions will cover the procedures and results of the previous week's exercises. Other questions will pertain to procedures for the upcoming lab. You may use your lab notebook for the quizzes.

Lab Assignments: Each assignment is worth 8 points. Information for each assignment will be provided in lab.

Group Microscope Project: Each lab group will develop and complete an experiment and write a summary of the group lab results in standard scientific format. Further information will be provided in lab. All students are required to complete this assignment.

Laboratory Notebook: Each member of a lab group should actively participate in the lab work and should keep a well organized notebook of his or her lab work. Notebooks can be used during the lab quizzes and will be collected on the last day of lab. Notebooks will be graded based on their completeness, accuracy, and order. More information will be provided in lab.

Grade Assessment:

To assess your lecture grade divide the total points earned by the total possible points & multiply by 100.

Table 1.

Exam 1	Exam 2	Exam 3	Exam 4	Final Exam	Total
100	100	100	100	100	500

Use the empty second row in the table above to keep track of your individual points and lecture percentage at any point in the semester.

To assess your lab grade divide the total points earned by the total possible points & multiply by 100.

Table 2.

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	A 1	A 2	A 3	N 1	Total
8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	10	130

Q= Laboratory Quiz, A= Laboratory Assignment in or outside of class, N= Laboratory Notebook Check

Use the empty second row in the table above to keep track of your individual points and lab percentage at any point in the semester.

To assess your final grade add the points earned in lecture (Table 1) with the points earned in lab (Table 2) and divide the total by the total possible points. Then multiply by 100.

Table 3.

Lecture Points	Lab Points	Total
130	500	630

Grade Calculation & Distribution:

Grade Calculation		Grade Distribution		
Type	Points	Letter	Percentage	Point Range
Exam 1	100	A	90-100%	564-630
Exam 2	100	B	80-89%	501-563
Exam 3	100	C	70-79%	438-500
Exam 4	100	D	60-69%	375-437
Final Exam	100	F	≤ 59%	≤ 374 points
Laboratory	130			
Total	630			

Notes on grading: Students should note that a grade of "A" in this course represents an exemplary command of the material covered. To obtain this grade of excellence, it is recommended that students study daily and clarify with their instructor any problems regarding course information, as they arise.

Mid-term, or in-progress grades: The instructor is required to submit in-progress grades prior to mid-term as posted online (10/01/2009). In theory, a mid-term grade is necessary for a student to assess how s/he is doing in class by midterm. In this course, students will have feedback on at least one major exam by midterm, several lab quizzes, lab assignments, and any homework or

writing assignments. The instructor will, in general, assign an overall average grade at this point on the normal scale of A-F viewable on Banner. Students receiving a grade of “D” or lower should therefore carefully evaluate their option of dropping this course by midterm without academic penalty.

Attendance Policy: Attendance in this course is highly recommended, unless you are sick. Students should be seated at the beginning of class. If you are late, your attendance may not be acknowledged. Four opportunities to earn bonus points will be announced in class during the semester. If absent, the bonus points will not count against your grade; however, the points cannot be made up. The student is responsible for all material missed regardless of the reason for absences. **ABSOLUTELY NO LECTURES OR LABORATORIES CAN BE "MADE UP."** Laboratories in particular are important not to miss as stated above. In the event that a student will miss a lab, s/he should notify the instructor in writing by email. It is the instructor’s prerogative to accept the excuse or not. Attendance will be recorded for lab sessions using the lab quiz. Students who miss two labs without an excuse or three labs total cannot receive a grade above a “D”.

Important information:

- For Biology majors, a grade of C or higher is required in this course before additional biology courses can be attempted.
- Midterm, October 8th, is the last day for withdrawing without penalty.

Procedure for exams:

- No books, electronic devices, or notebooks will be allowed during exams. Students using such items will be asked to leave and will receive a zero for the exam.
- No talking will be allowed during the exam, but students are permitted to ask the instructor questions.
- Each student will be given an exam to be completed and handed back to the instructor.
- Students must bring a pencil and will take the exam during the stated lecture time only.
- **NOTE:** You will have the class time only to complete each lecture exam.

Student identification: Students should have in their possession at all times their VSU student identification card. In order to verify the identification of students officially enrolled in the course, it is the instructor’s prerogative to request official student photo identification cards at any time during lecture. During examinations, students will routinely be asked to display their VSU student identification cards visibly on the desk top and to make them available for inspection by their instructor and/or assistants.

Privacy Act (FERPA): The Family Educational Rights and Privacy Act (FERPA) prohibit the public posting of grades by social security number or in any manner personally identifiable to the individual student. No grades can be given by email or over the telephone, as positive identification cannot be made by this manner.

Disruptive behavior: No disruptive behavior of any kind will be tolerated in this course. Students should restrict talking and discussion to pertinent questions related to course material and these questions should be directed toward the instructor. Entering a classroom late or early is discouraged. Any student disrupting lectures will be required to leave the classroom. Use of cellular telephones, pagers, or any similar remote communication device is prohibited during scheduled lectures, laboratories, or examinations. If students bring cellular telephones or similar devices to lecture, it is their responsibility to switch them off prior to the beginning of the lecture period.

Biology Tutoring: The Student Success Center (SSC) at Valdosta State University is located in Langdale Residence Hall above the Tech Shop and is available to all students. The SSC provides free peer tutoring in core curriculum courses, including biology, chemistry, math, writing, and foreign languages. The SSC also provides free professional academic advising and on-campus job information in one location. Call 333-7570 to make an appointment, or visit the website: www.valdosta.edu/ssc.

Students with Disabilities: Students requesting classroom accommodations or modifications because of a documented disability must contact the Access Office for Students with Disabilities located in room 1115 Nevins Hall. The phone number is (229) 245-2498.

Cheating: Students caught cheating will receive a grade of “F” for the assignment in question and will be reported to the Dean of Students.

TENTATIVE LECTURE OUTLINE:

Lecture:	Date:	Topics:	Chapters :
1	August 17 (M)	Introduction to Biology	1
2	August 19 (W)	Introduction to Biology; Chemistry of Life	1-2
3	August 24 (M)	Macromolecules & origin of life	2-3
4	August 26 (W)	Macromolecules & origin of life	3
5	August 31 (M)	Cells	4
6	Sept. 02 (W)	Cells; Exam 1 Review	4
--	Sept. 07 (M)	LABOR DAY HOLIDAY	
--	Sept. 09 (W)	EXAM # 1	1-4
7	Sept. 14 (M)	Cell membrane	5
8	Sept. 16 (W)	Energy, Enzymes, & metabolism	6
9	Sept. 21 (M)	Pathways that harvest chemical energy	7
10	Sept. 23 (W)	Pathways that harvest chemical energy; Photosynthesis	7, 8
11	Sept. 28 (M)	Photosynthesis	8
12	Sept. 30 (W)	Exam 2 Review	
--	Oct. 05 (M)	EXAM # 2	5-8
13	Oct. 07 (W)	Chromosomes, the cell cycle, and cell division	9
14	Oct. 12 (M)	Chromosomes, the cell cycle, and cell division	9
15	Oct. 14 (W)	Genetics: Mendel and Beyond; DNA and Role in Heredity	10, 11
--	Oct. 19 (M)	FALL BREAK; NO CLASS	
16	Oct. 21 (W)	Genetics: Mendel and Beyond; DNA and Role in Heredity	10, 11
17	Oct. 26 (M)	DNA to protein	12
18	Oct. 28 (W)	DNA to protein; Exam 3 Review	12
--	Nov. 02 (M)	EXAM # 3	9-12
19	Nov. 04 (W)	The Eukaryotic Genome	14
20	Nov. 09 (M)	Cell signaling & communication	15
21	Nov. 11 (W)	Recombinant DNA & biotechnology	16
22	Nov. 16 (M)	Recombinant DNA & biotechnology	16
23	Nov. 18 (W)	Exam 4 Review	
--	Nov. 23 (M)	EXAM # 4	14-16
--	Nov. 25 (W)	THANKSGIVING HOLIDAY; NO CLASSES	
24	Nov. 30 (M)	Genome sequences, molecular biology, & medicine	17
25	Dec. 02 (W)	Development	19-20
26	Dec. 07 (M)	Development ; Catch-up, review	19-20
--	Dec. 11 (F)	FINAL EXAM; 5:00-7:00 pm (BC 1023)	Cumulative

Tentative Laboratory Schedule, BIOL 1107, sections J, K, L, FALL 2009

LABORATORY EXERCISES:

Lab	Week:	Topic:
1	August 17-19	Laboratory Introduction "The Black Box"- Scientific Method.
2	August 24-26	Basics of the Light Microscope.
3	Aug. 31-Sept. 2	Living Cells
--	September 7	LABOR DAY HOLIDAY– NO LAB
4	September 8-9	Group Microscope Project: Proposal Discussion & set-up
5	September 14-16	Group Microscopy Project: Data collection lab <i>(Lab assignment 1 – Summary of Group Results, Discussion)</i>
6	September 21-23	Cellular Water Relations
7	September 28-30	Measuring metabolic activity
8	October 5-7	Protein extraction & quantification <i>(Lab assignment 2)</i>
9	October 12-14	Enzymology Lab: basics of α -amylase activity
--	October 19-21	FALL BREAK – NO LAB
10	October 26-28	Enzyme Regulation: Investigation of the effects of temperature on enzyme activity <i>(Lab assignment 3)</i>
11	November 2-4	Cell division: Mitosis & Meiosis
12	November 9-11	Genetic engineering I: DNA fingerprinting
13	November 16-18	Genetic engineering II: Genetically Modified Organisms
--	November 23-25	THANKSGIVING HOLIDAY – NO LAB
14	Nov. 30-Dec. 2	Genetic Engineering II, continued; <i>(Notebooks DUE in lab)</i>

<p>Generalized Eukaryotic Cell</p> <p>A. NUCLEUS</p> <ol style="list-style-type: none"> Defining characteristics: membrane bound nucleus, presence of organelles, meiotic division Nucleus: compartmentalization, storage of genetic information Nucleolus: location and function Nuclear envelope, nuclear pores <p>B. MEMBRANE-BOUND ORGANELLES</p> <ol style="list-style-type: none"> Mitochondria <ol style="list-style-type: none"> site of ATP production self-replication inner and outer membrane Lysosomes: membrane vesicle containing hydrolytic enzymes Endoplasmic reticulum: <ol style="list-style-type: none"> rough and smooth components rough endoplasmic reticulum site of ribosomes double membrane structure, role in membrane biosynthesis role in biosynthesis of secreted proteins Golgi apparatus: general structure and role in packaging and secretion <p>C. PLASMA MEMBRANE</p> <ol style="list-style-type: none"> General function in cell containment Protein and lipid components, fluid mosaic model Osmosis Passive and active transport Membrane channels Sodium/potassium pump Membrane receptors Membrane potential Exocytosis and endocytosis Cell-cell communication (General concepts of cellular adhesion) <ol style="list-style-type: none"> gap junctions tight junctions desmosomes <p>D. CYTOSKELETON</p> <ol style="list-style-type: none"> General function in cell support and movement Microfilaments: composition and role in cleavage and contractility Microtubules: composition and role in support and transport Intermediate filaments, role in support Composition and function of eukaryotic cilia and flagella Centrioles, microtubule organizing centers 	<p>Biological Molecules</p> <p>A. CARBOHYDRATE</p> <ol style="list-style-type: none"> Description <ol style="list-style-type: none"> nomenclature and classification, common names absolute configuration cyclic structure and conformations of hexoses primers and anomers Hydrolysis of the glycoside linkage <p>B. AMINO ACIDS AND PROTEINS</p> <ol style="list-style-type: none"> Description <ol style="list-style-type: none"> absolute configuration at the α position amino acids as dipolar ions classification classification <ol style="list-style-type: none"> acidic or basic hydrophobic or hydrophilic Reactions <ol style="list-style-type: none"> peptide linkage hydrolysis General principles <ol style="list-style-type: none"> 1° structure of proteins 2° structure of proteins <p>C. LIPIDS</p> <p>Description; structure</p> <ol style="list-style-type: none"> steroids terpenes triacyl glycerols free fatty acids <p>D. PHOSPHORUS COMPOUNDS</p> <ol style="list-style-type: none"> Description <ol style="list-style-type: none"> structure of phosphoric acids (anhydrides and esters) Important reactions <ol style="list-style-type: none"> Wittig reaction <p>MITOSIS</p> <ol style="list-style-type: none"> Mitotic process: prophase, metaphase, anaphase, telophase, interphase Mitotic structures: <ol style="list-style-type: none"> centrioles, asters, spindles chromatids, centromeres, kinetochores nuclear membrane breakdown and reorganization mechanisms of chromosome movement Phases of cell cycle: G_0, G_1, S, G_2, M Growth arrest
--	--

<p>Molecular Biology: Enzymes and Metabolism</p> <p>A. ENZYME STRUCTURE AND FUNCTION</p> <ol style="list-style-type: none"> 1. Function of enzymes in catalyzing biological reactions 2. Reduction of activation energy 3. Substrates and enzyme specificity <p>B. CONTROL OF ENZYME ACTIVITY</p> <ol style="list-style-type: none"> 1. Feedback inhibition 2. Competitive inhibition 3. Non-competitive inhibition <p>C. BASIC METABOLISM</p> <ol style="list-style-type: none"> 1. Glycolysis, anaerobic and aerobic, substrates and products 2. Krebs cycle, substrates and products, general features of the pathway 3. Electron transport chain and oxidative phosphorylation, substrates and products, general features of the pathway 4. Metabolism of fats and proteins <p>Molecular Biology: DNA and Protein Synthesis</p> <p>I. DNA STRUCTURE AND FUNCTION</p> <p>A. DNA STRUCTURE AND FUNCTION</p> <ol style="list-style-type: none"> 1. Watson-Crick model of DNA; double helix 2. DNA composition: purine and pyrimidine bases, sugars, phosphate 3. Base pairing specificity: A w/ T, G w/ C 4. Function in transmission of genetic information <p>B. DNA REPLICATION</p> <ol style="list-style-type: none"> 1. Mechanism of replication: separation of strands, specific coupling of free N. acids 2. Semi-conservative nature of replication <p>C. REPAIR OF DNA</p> <ol style="list-style-type: none"> 1. Repair during replication 2. Repair of mutations <p>D. RECOMBINANT DNA</p> <ol style="list-style-type: none"> 1. Restriction enzymes 2. Hybridization 3. Gene cloning <p>II. PROTEIN SYNTHESIS</p> <p>A. GENETIC CODE</p> <ol style="list-style-type: none"> 1. Central Dogma: DNA → RNA → protein 2. Codon-anticodon relationship 3. Missense, nonsense codons 4. Initiation, termination codons <p>B. TRANSCRIPTION</p> <ol style="list-style-type: none"> 1. Messenger RNA 2. tRNA, rRNA 3. Mechanism of transcription <p>C. TRANSLATION</p> <ol style="list-style-type: none"> 1. Roles of mRNA, tRNA, rRNA 2. Role and structure of ribosomes 	<p>Molecular Biology: Eukaryotes</p> <p>A. EUKARYOTIC CHROMOSOME ORGANIZATION</p> <ol style="list-style-type: none"> 1. Chromosomal proteins 2. Telomeres, centromeres <p>B. CONTROL OF GENE EXPRESSION IN EUKARYOTES</p> <ol style="list-style-type: none"> 1. Transcription regulation 2. DNA binding proteins, transcription factors 3. Cancer as a failure of normal cellular controls, oncogenes 4. Post-transcriptional control [GEC] <p>Genetics</p> <p>A. MENDELIAN CONCEPTS</p> <ol style="list-style-type: none"> 1. Phenotype and genotype 2. Gene 3. Locus 4. Allele: single and multiple 5. Homo- and heterozygosity 6. Wild type 7. Recessiveness 8. Complete dominance 9. Co-dominance 10. Incomplete dominance, leakage, penetrance, expressivity 11. Gene pool <p>B. MEIOSIS AND GENETIC VARIABILITY</p> <ol style="list-style-type: none"> 1. Significance of meiosis 2. Important differences between meiosis and mitosis 3. Segregation of genes <ol style="list-style-type: none"> a. Independent assortment b. linkage c. recombination d. single crossovers e. double crossovers 4. Sex-linked characteristics <ol style="list-style-type: none"> a. very few genes on Y chromosome b. sex determination c. cytoplasmic inheritance 5. Mutation <ol style="list-style-type: none"> a. general concept of mutation-error in DNA sequence b. types of mutations: random, translation error, transcription error, base substitution, inversion, addition, deletion, translocation, mispairing c. advantageous vs. deleterious mutation d. inborn errors of metabolism e. relationship of mutagens to carcinogens] <p>C. ANALYTIC METHODS</p> <ol style="list-style-type: none"> 1. Hardy-Weinberg Principle 2. Test cross: back cross, concepts of parental, F1 and F2 generations 	<p>Evolution</p> <p>A. EVOLUTION</p> <ol style="list-style-type: none"> 1. Natural selection <ol style="list-style-type: none"> a. fitness concept b. selection by differential reproduction c. concepts of natural and group selection d. evolutionary success as increase in percent representation in the gene pool of the next generation 2. Speciation <ol style="list-style-type: none"> a. definition of species b. polymorphism c. adaptation and specialization d. concepts of ecological niche, competition e. concept of population growth through competition f. inbreeding g. outbreeding h. bottlenecks i. divergent, parallel, and convergent evolution j. Symbiotic relationships <ol style="list-style-type: none"> a. Parasitism b. Commensalism 3. Ontogeny recapitulates phylogeny 4. Evolutionary time as measured by gradual random changes in genome 5. Origin of life
---	--	--